

Soluble Lead Flow Battery Technology

**General Atomics &
University of California, San Diego**

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Conventional Lead Acid Battery

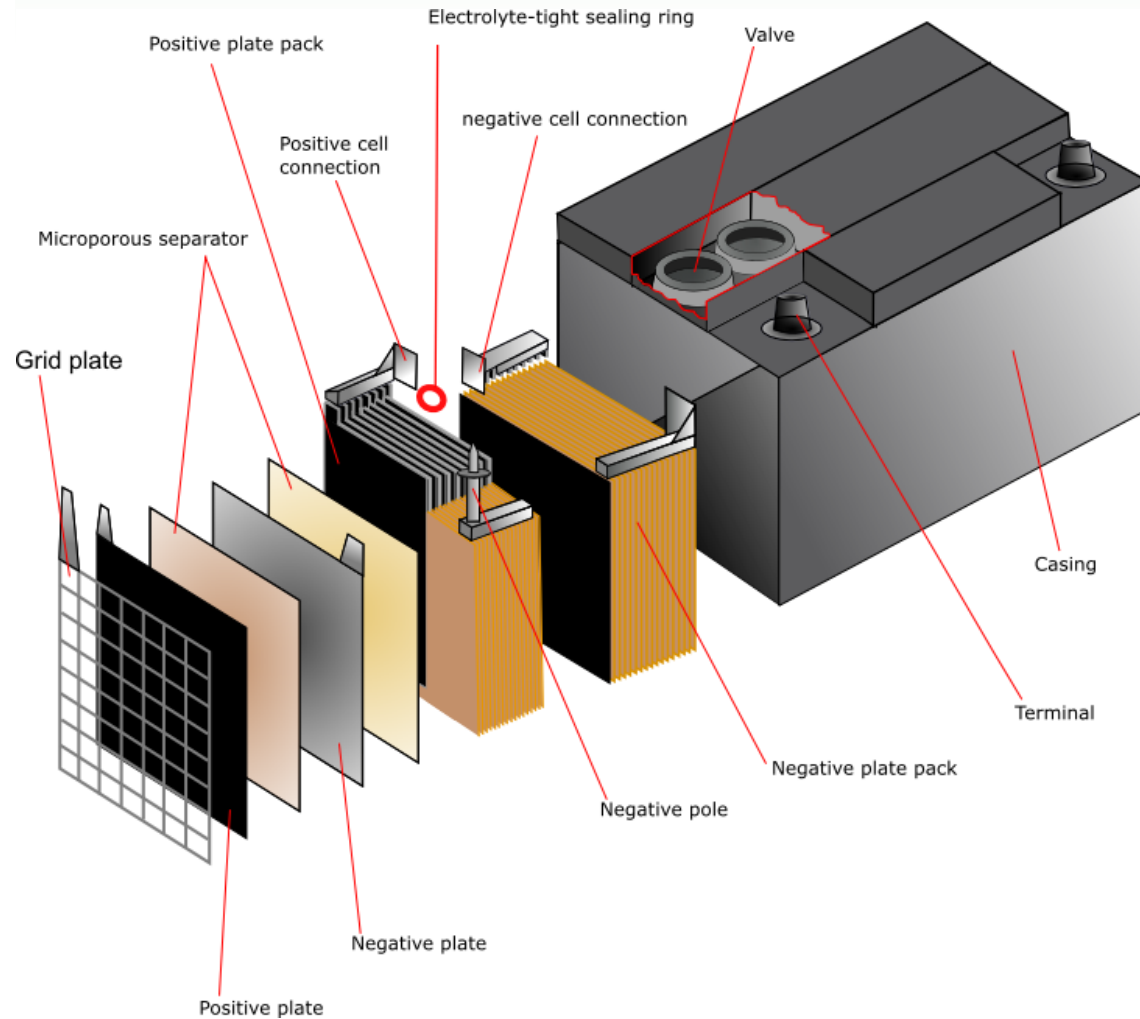
Dominant Energy Storage Technology for 100+ yrs



Advantages

- Low cost
- Good efficiency
- Safety, Reliability

Conventional Lead Acid Battery



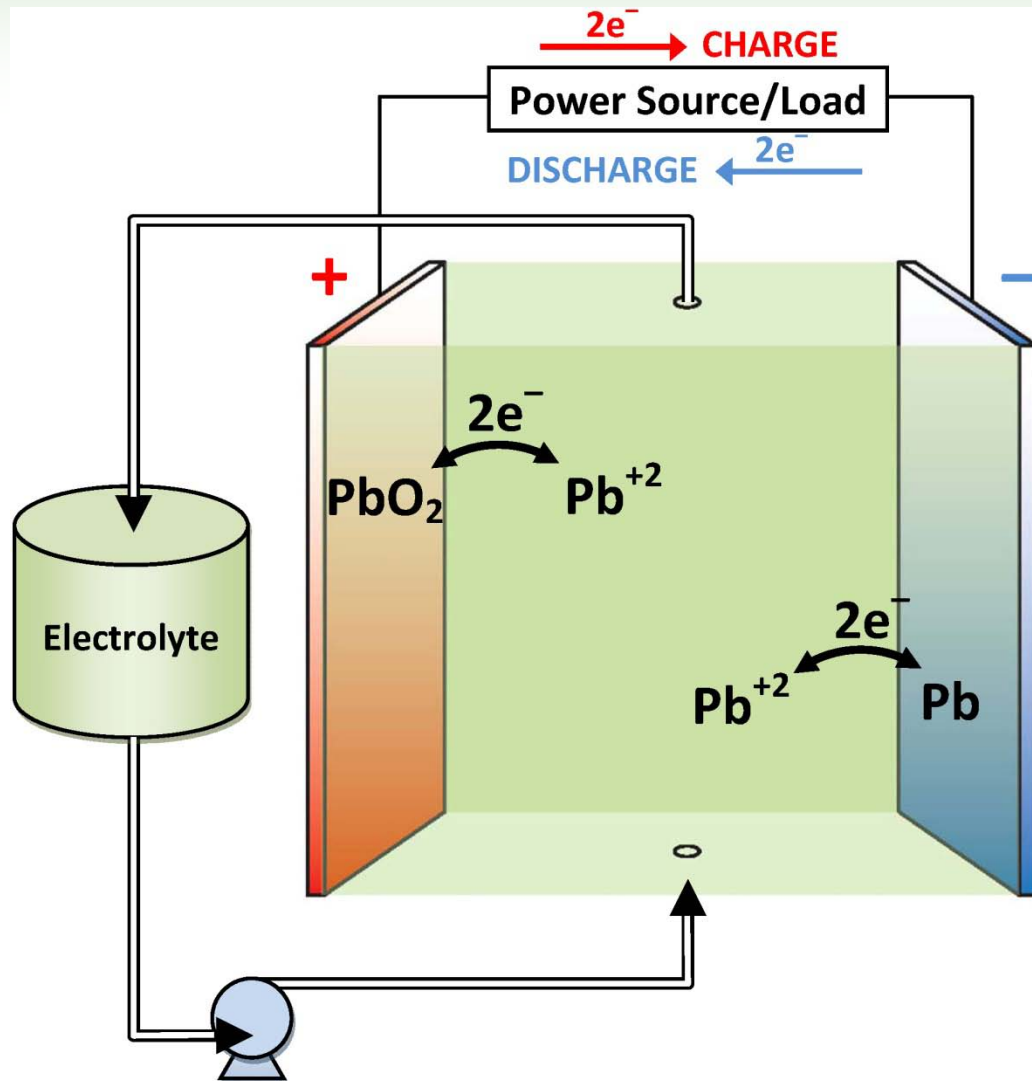
Current State-of-the Art

- \$180-200 /kWh
- 1000 deep cycles

Our / GRIDS Goal

- <\$100 /kWh
- >5000 deep cycles

Grid Scalable Lead Acid Battery



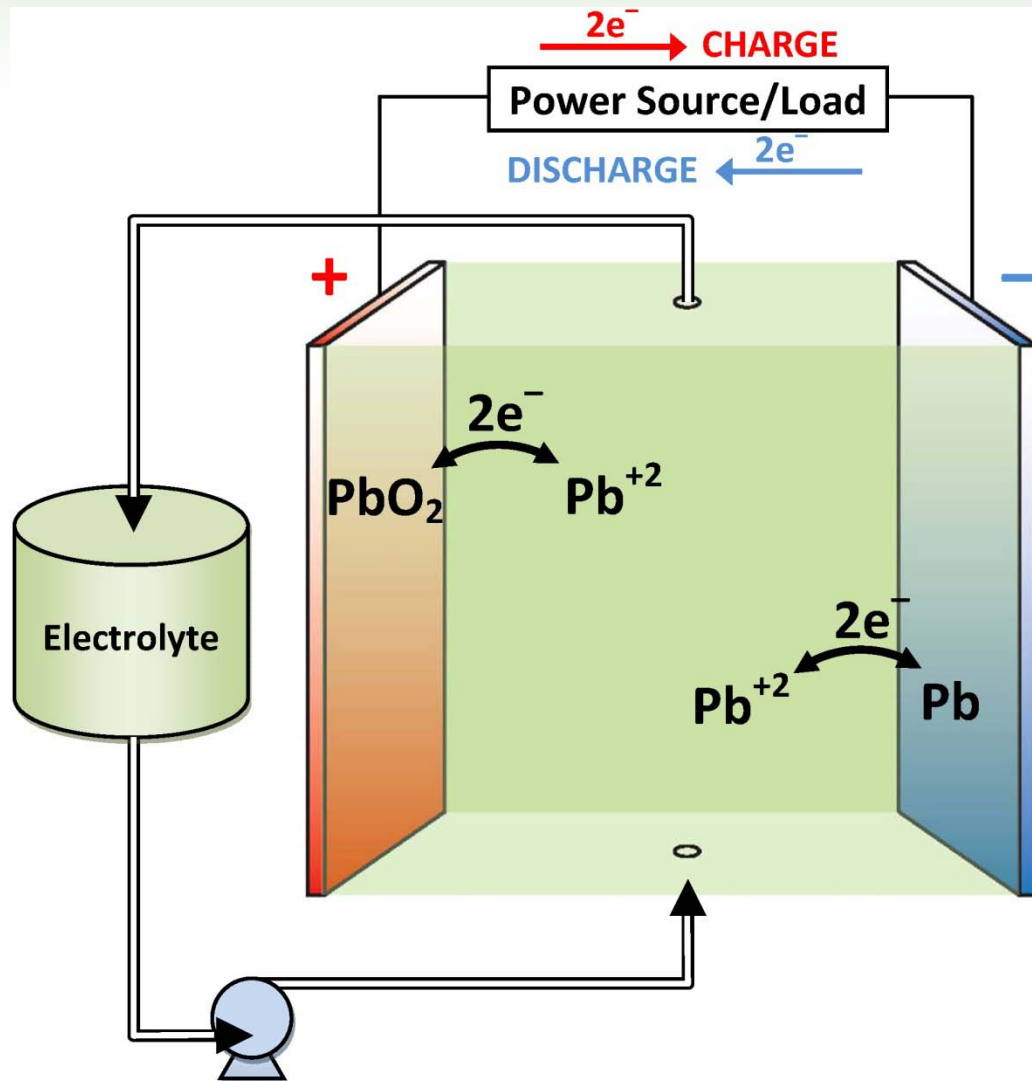
Innovations

- MSA-based electrolyte
- Carbon-based electrodes
- Flow-battery design

Impact

- Cost Reduction
- Grid Scalable
- Cycle-life Improvement

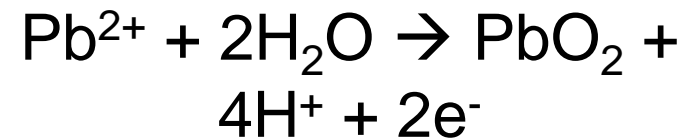
Soluble Lead Chemistry



Anode



Cathode



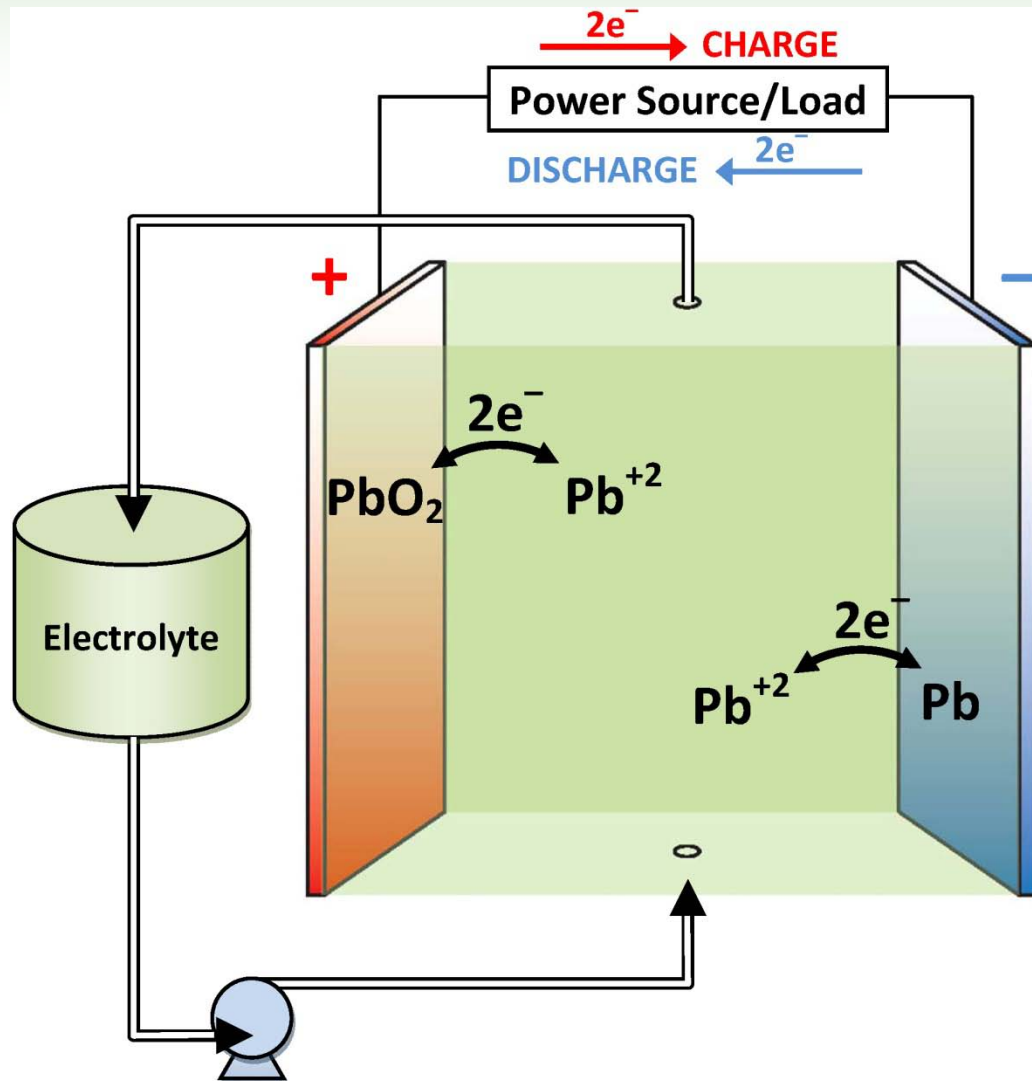
Cell Potential

1.76V

Energy Density

65Wh/kg, 95Wh/L

Unique Flow Battery Design

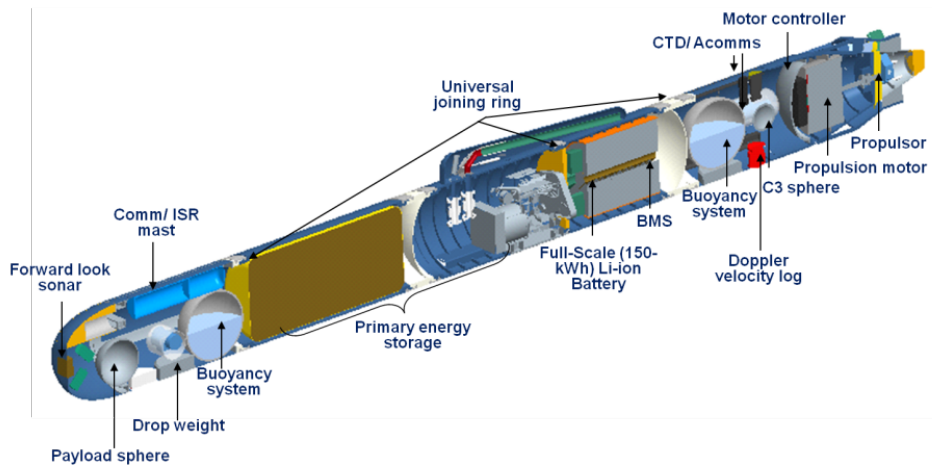


- Design Features
- 1) Single Electrolyte
 - 2) No membrane or separator required
 - 3) Simplifies Balance-of-Plant

GA / UCSD Core Strengths

General Atomics

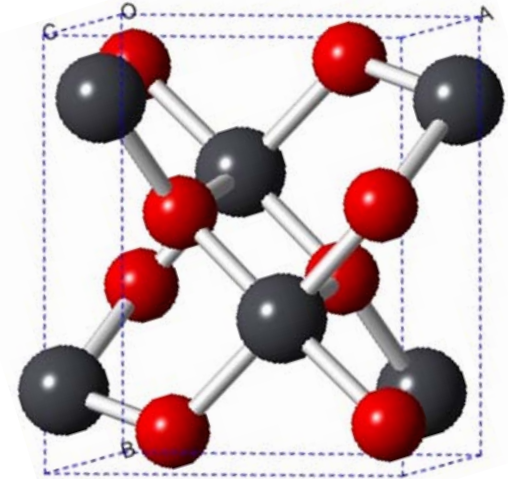
- Energy storage expertise (flywheels, SMES, thermal-chemical)
- Chemistry Labs and Battery Test Facilities



GA Unmanned Underwater Vehicle

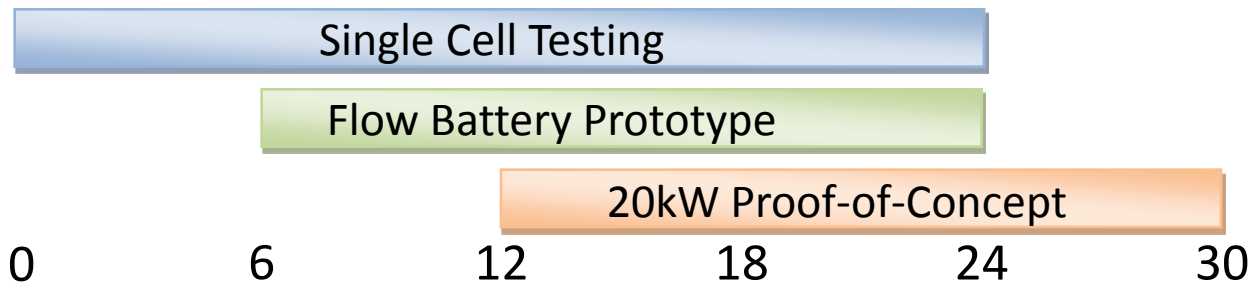
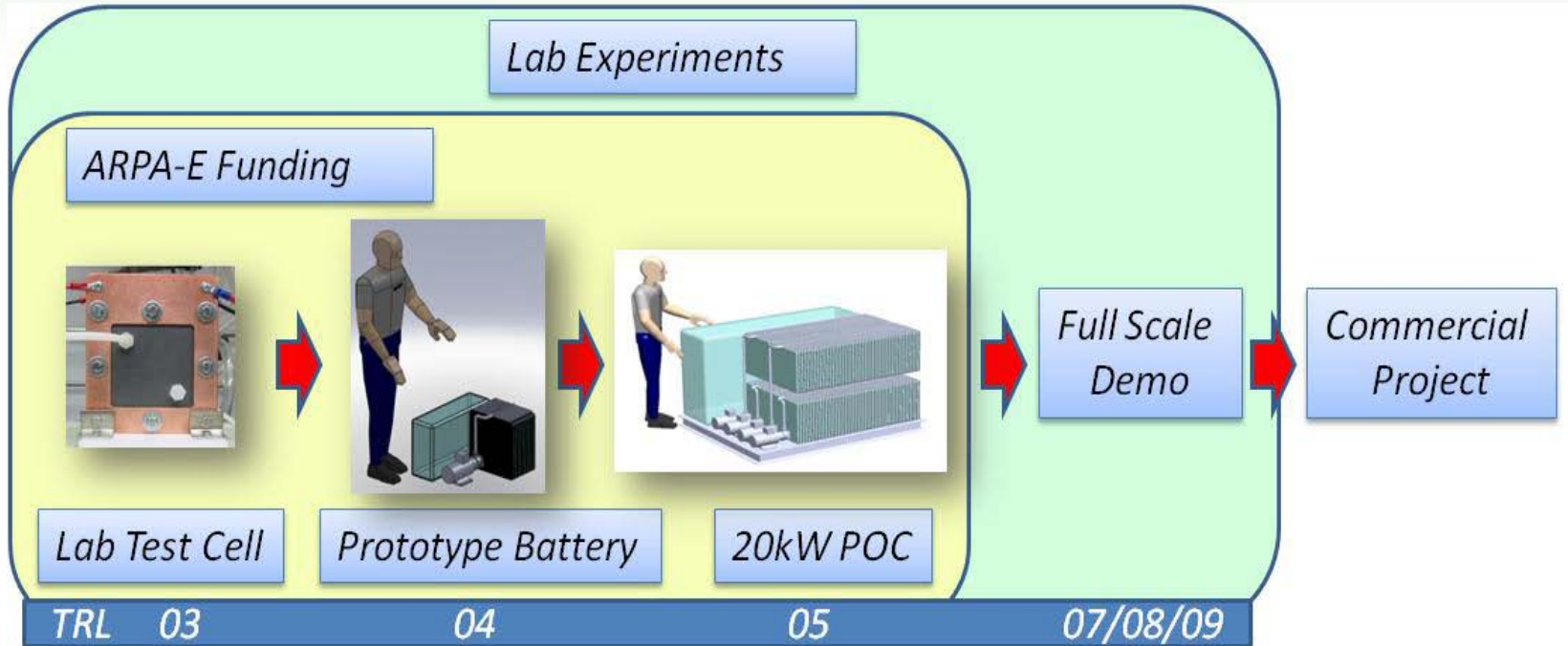
UCSD

- Laboratory for Energy Storage & Conversion (Prof. Shirley Meng)
- Materials Synthesis, Modeling & Computation, Characterization



Alpha-PbO₂

Project Overview / Status



Timeline (Months)